REMARKS

Claims 1, 3, 7-9, 15, 19 and 26 were pending in this application.

Applicants have cancelled Claims 1, 7 and 15, without prejudice or disclaimer of that which is defined thereby.

Accordingly, Claims 3, 8, 9, 19 and 26 remain pending herein.

Applicants have amended Claims 3, 8 and 9.

Applicants now turn to the merits of the Action.

Section 112 Rejection

Claim 15 has been rejected under 35 U.S.C. § 112, second paragraph as allegedly being indefinite for the reasons given at page 2 of the Action.

Applicants have cancelled Claim 15, thus rendering moot the Section 112 rejection thereof.

Section 102 Rejection

Claims 1, 7 and 19 are rejected under 35 U.S.C. § 102(b) as allegedly being unpatentable by U.S. Patent No. 5,393,498 (Gonya et al.) ("the '498 patent").

Applicants have cancelled Claims 1 and 7, thus rendering mood the Section 102 rejections thereof.

Applicants have amended Claim 19 to make it depend from Claim 3. The Section 102 rejection of Claim 19 has thus been obviated. Reconsideration and withdrawal of the Section 102 rejection of Claim 19 are respectfully requested.

Section 103 Rejection

Claim 1 is rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable by U.S. Patent No. 5,837,191 (Gickler et al.) ("the '191 patent").

Claim 1 is rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable by U.S. Patent No. 5,405,577 (Seelig et al.) ("the '577 patent").

Applicants' cancellation of Claim 1 moots the Section 103 rejections over the '191 patent and the '577 patent.

Claims 3 and 26 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable by U.S. Patent No. 5,393,489 (Gonya et al.) ("the '489 patent") and further in view of U.S. Patent No. 4,758,407 (Ballentine et al.) ("the '407 patent).

Claim 8 is rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable by the '489 patent and further in view of the '407 patent.

Claim 9 is rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable by the '489 patent and further in view of the '407 patent.

Applicants traverse the remaining Section 103 rejections, which are based on the combination of the '489 patent and the '407 patent.

As the Examiner is aware, to establish a *prima facie* case of obviousness under Section 103, there must be some reason, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the references or to combine reference teachings. KSR International Co. v. Teleflex Inc., 127 S.Ct. 1727, 1741 (2007). Moreover, if more than one document is combined together to form a reception under Section 103, which is the case here, the reason to make the claimed combination, and a reasonable expectation of success, must be found elsewhere than in Applicants' disclosure, such as in the cited documents of record, the nature of the problem to be solved, or in the knowledge/understanding of the person of ordinary skill in the art. MPEP § 2143; In re Vaeck, 947 F.2d 488 (Fed. Cir. 1991). The instant Section 103 rejections do not meet these requirements.

For the Examiner's benefit, Applicants provide a brief review of the invention as presently claimed.

The inventive lead free soldering material as defined for instance with reference to Claims 3 and 26 includes the combination of six elements in quite tailored amounts, which in combination improves temperature cycling and improves hardening.

These six elements are: Sn; Ag; Bi; Sb; Cu; and Ni.

More specifically, with reference to Claim 3 a lead free soldering material consisting essentially of Sn (tin), 2 to 10 wt.% Ag, Bi, 1 to 3 wt.% Sb, 0.5 to 3 wt.% Cu and 0.05 to 0.3 wt.% Ni is presented, where the Sb:Bi wt.% ratio is from 1:1.5-3. And with reference to Claim 26 a lead free soldering material consisting essentially of Sn (tin), 2 to 10 wt.% Ag, 1 to 3 wt.% Bi, 1 to 3 wt.% Sb, 0.5 to 3 wt.% Cu and 0.05 to 0.3 wt.% Ni is presented.

Thus, not only is a specific combination of six elements presented, but those six elements are also provided in defined ranges and in the case of the invention defined in Claim 3, a weight ratio between two of the elements is also set forth.

In responding to the Action, Applicants have once again submitted a declaration from Malcolm E. Warwick -- here, styled Second Declaration Under 37 C.F.R. § 1.132 of Malcolm E. Warwick (the "Second Warwick Declaration").

In this declaration, Dr. Warwick has presented information germane to the subject application using similar data as previously submitted, though in a slightly different format.

Before discussing the Second Warwick Declaration, however, Applicants provide some preliminary comments on the documents cited as references in support of certain of the claim rejections under Section 103 advanced in the Action against the pending claims.

The '489 patent, cited as a primary reference, is directed to and claims a high solidus temperature, high service temperature, high strength multi-component solder alloy consisting of 93.5 to 94.0 weight % Sn, 2.5 to 3.0 weight % Ag, 1.0 to 2.0 weight percent Bi, 1.0 to 2.0 weight percent Sb, and 1.0 weight percent Cu.

The '489 patent among other things is devoid of any mention or suggestion of Ni at all, let alone in the amounts set forth in the pending claims.

The '407 patent, cited as a secondary reference, is directed to a variety of embodiments, including:

A. 0.1-2.0% Ni, 3.0-5.0% Cu, 4.0-6.0% Sb, and 87.0-92.9% Sn;

B. 0.1-0.5% Ag, 0.1-2.0% Ni, 3.0-5.0% Cu, 4.0-6.0% Sb and 87.0-92.9% Sn;

C. 0.1-0.5% Ag, 3.0-5.0% Cu, 4.0-6.0% Sb and 87.0-92.9% Sn;

D. 0.1-2.0%, Ni, 3.0-5.0% Cu and 93.0-96.9% Sn; or

E. 0.1-0.5% Ag, 0.1-2.0% Ni, 3.0-5.0% Cu and 92.5%-96.8% Sn.

The '407 patent fails among other things to note in any of these embodiments the addition of Bi at all, again let alone in the amounts set forth in the pending claims.

Referring now to the Second Warwick Declaration, Dr. Warwick explains why simply combining the '489 patent with the '407 patent, as the Examiner has done in the Action, would have been contrary to an approach that a person of ordinary skill in the art would have taken in devising the invention captured by the pending claims.

Dr. Warwick in his declaration tells the reader that an addition of Bi to the SAC alloy appears to improve the operating temperature (in terms of creep resistance) and reduce the soldering process temperature. (Second Warwick Declaration, ¶ 6.)* Dr. Warwick thus concludes in this regard that someone skilled in the art would know that high levels of Bi could increase the risk of low melting temperature phases in the

alloy. The low melting phases that may be created would be undesirable because they would tend to reduce reliability in fatigue under temperature cycling. All else being equal, in Dr. Warwick's view, this would discourage their use in demanding operating environments. Id.

Dr. Warwick then explains an addition of Sb to the SAC alloy appears to improve the operating temperature (in terms of creep resistance) but at the expense of increased soldering process temperature. Dr. Warwick thus concludes in this regard that someone skilled in the art would know this occurrence to be an unacceptable compromise in physical properties. This is so, explains Dr. Warwick, because even small increases above the process of the SAC alloy would be seen by someone of ordinary skill in the art as a reason to discount candidate alloys. Dr. Warwick concludes this has been a major technical obstacle for the adoption in the industry of tin-rich alloys, including the SAC alloy, as a replacement for tradition tin-lead solders. (Second Warwick Declaration, ¶7.)

Dr. Warwick then points out that an addition of Bi and Sb to the SAC alloy improves the operating temperature (in an additive fashion), but that the effect of Bi to lower the soldering process temperature is small compared with the effect of Sb in increasing it. Indeed, Dr. Warwick notes in his

* A SnAg3.8Cu 0.7 alloy is referred to herein as the "SAC alloy".

declaration that only a SAC alloy with a high Bi content and a relatively low Sb content achieves an unacceptable soldering process temperature. Dr. Warwick concludes here that such a SAC alloy would still not be suitable for demanding operating environments. (Second Warwick Declaration, ¶¶ 8-9.)

The addition of Bi and Sb to the SAC alloy is the thrust of the teaching of the '489 patent.

Dr. Warwick points out in his declaration that in his view these data would suggest to someone skilled in the art that SAC+Bi+Sb alloys, as taught by the '489 patent, would not be suitable to address the needs identified in the subject application. The subject application provides an alloy based on a SAC alloy that exhibits a comparatively low melting point while at the same time is designed for the highest possible usage temperatures of the solder joints being formed, which are particularly well-suited for microelectronic packaging and assembly applications. (Second Warwick Declaration, ¶¶ 9-10.)

Based on this discussion, the citation of the '489 patent as a primary reference in the Section 103 rejections runs afoul of the "lead compound" analysis discussed in Takeda Chemical Industries, Ltd. v. Alphapharm Pty., Ltd., 492 F.3d 1350 (Fed. Cir. 2007).

There, the Court stated: "in order to find a prima facie case of unpatentability in such instances, a showing that the 'prior art would have suggested making the specific molecular modifications necessary to achieve the claimed invention' was also required." Takeda, 492 F.3d at 1356 (citations omitted).

The Court continued:

> While the KSR Court rejected a rigid application of the teaching, suggestion, or motivation ("TSM") test in an obviousness inquiry, the Court acknowledged the importance of identifying "a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does" in an obviousness determination. KSR, 127 S.Ct. at 1731.
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> Thus, in cases involving new chemical compounds, it remains necessary to identify some reason that would have led a chemist to modify a known compound in a particular manner to establish prima facie obviousness of a new claimed compound.

Takeda, 492 F.3d at 1356-1357.

Here, based on Dr. Warwick's explanation set forth in his declaration and discussed in this paper, it is plain that there is no reason why a person of ordinary skill in the art would have looked to the '489 patent as a starting point to make

the soldering material defined by either of Claims 3 or 26 (or for that matter the claims dependent therefrom).

Turning to the '407 patent, that document does nothing to remedy the deficiencies of the '489 patent as a primary reference, contrary to the position advanced by the Examiner in the Action. Apart from disclosing the presence of the missing sixth metal from the soldering material presented in the pending claims, the various embodiments set forth in the '407 patent would not lead persons of ordinary skill in the art to consider the desirability of combining that disclosure with the '489 patent.

Dr. Warwick addresses the '407 patent in his declaration. At paragraph 12, Dr. Warwick indicates that the object of the '407 patent seems to be to create alloys with a wide melting range suitable for plumbing applications, specifically adding Ni to achieve this effect along with the high levels of Cu and Sb. Such alloys would not be considered suitable for microelectronic packaging and assembly processes since a wide melting range introduces processing problems for end-users. (Second Warwick Declaration, ¶ 12.)

Dr. Warwick notes in his declaration that only two of the embodiments of the '407 patent refer to the addition of Ni to the SAC alloy. (Id.)

Dr. Warwick remarks that adding Ni to the SAC alloy at a level of 0.2% and 2.0% has the effect of reducing the maximum operating temperature (in terms of creep resistance) and increasing the soldering process temperature. According to Dr. Warwick, this shows that Ni additions have at best minimal effect, and what effect they do have on SAC alloy is to increase the soldering process temperature and/or reduce dramatically the operating temperature, neither of which is a particularly attractive feature. Dr. Warwick then concludes that these data would suggest to someone skilled in the art that it would not be advantageous to add Ni to the SAC alloy. (Second Warwick Declaration, ¶ 13.)

Dr. Warwick also explains the practical problems that would be encountered by simply adding Ni to Sn-rich alloys. (Second Warwick Declaration, ¶ 14.)

For instance, dissolving Ni in a Sn-rich alloy, such as the SAC alloy, requires that the melt be heated to higher temperatures than is necessary for the addition of, for example, Bi and Sb. Controlling the alloying process, particularly for relatively small additions of Ni within a tight tolerance range, requires close monitoring of melting and solidification and, where appropriate, the production of powder for solder pastes. Chemical analysis for Ni content in Sn-rich alloys is also

challenging, particularly from a quality control perspective. These factors add significant manufacturing costs to alloy production. (Id.)

Thus, taken together with the alloy performance data that Dr. Warwick considered and discusses in his declaration, someone skilled in the art would be discouraged in considering the addition of Ni to the SAC alloy, as the '407 patent would otherwise suggest. (Id.)

Dr. Wawick also discusses the impact that the combination of the addition of Ni and Bi has on the SAC alloy. The data to which Dr. Warwick refers illustrates the significant increase in maximum operating temperature (in terms of creep resistance) achieved by the addition of the combination of Ni and Bi to the SAC alloy. More specifically, Ni produces a marked improvement in operating temperature and a small reduction in soldering process temperature. (Second Warwick Declaration, ¶ 15.)

Dr. Warwick also remarks that in reviewing the data he found it surprising to observe a marked improvement in maximum operating temperature and a small reduction in soldering process temperature when Ni was added to an alloy of SAC+Bi+Sb. As mentioned above, this avoids the negative effects of low melting

temperature phases (due to excessive Bi) and high processing temperatures (due to excessive Sb). (Id.)

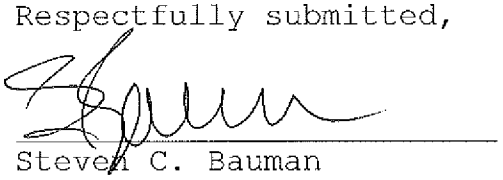
In sum, neither the '489 patent nor the '407 patent discloses, teaches or suggests, or provides motivation to reach, the invention as defined by the pending claims, let alone with a reasonable expectation of success or with any degree of predicatability in achieving that success.

Applicants -- and only Applicants -- chose a lead free soldering material consisting essentially of Sn (tin), 2 to 10 wt.% Ag, Bi, 1 to 3 wt.% Sb, 0.5 to 3 wt.% Cu and 0.05 to 0.3 wt.% Ni, where the Sb:Bi wt.% ratio is from 1:1.5-3 (defined in Claim 3) and a lead free soldering material consisting essentially of Sn, 2 to 10 wt.% Ag, 1 to 3 wt.% Bi, 1 to 3 wt.% Sb, 0.5 to 3 wt.% Cu and 0.05 to 0.3 wt.% Ni (defined in Claim 26).

Accordingly, in view of these amendments and remarks, Applicants respectfully submit that all rejections have been addressed, and they should no longer be maintained. Applicants also respectfully submit that the application is in condition for allowance, and respectfully request such an indication in the next written communication.

To the extent that the Examiner does not believe that the present paper places the application in condition for allowance, she is respectfully requested to contact Applicants' undersigned attorney by telephone at (860) 571-5001, by facsimile at (860) 571-5028 or by e-mail at steve.bauman@us.henkel.com. All correspondence should be directed to the address given below.

Respectfully submitted,



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